CLAIMS

What is claimed is:

1. An optical device comprising:

a) a partially reflecting, partially transparent reflector;

b) a movable mirror spaced apart from the reflector, wherein the movable mirror can move to vary a spacing T between the reflector and movable mirror;

c) a light collimator for projecting a light beam between the movable mirror and the reflector at an oblique angle so that the light beam travels by reflecting between the reflector and movable mirror.

2. The optical device of claim 1 wherein the oblique angle is in the range of 1-15 degrees from vertical.

3. The optical device of claim 1 wherein the movable mirror comprises a micromirror array, and wherein each micromirror in the array is separately movable vertically.

4. The optical device of claim 3 wherein the number of micromirrors is in the range of 2-1000.

5. The optical device of claim 3 wherein the micromirrors are disposed so that the light beam reflects at most once from each micromirror.

6. The optical device of claim 3 wherein the micromirror array and the reflector are planar parallel.

7. The optical device of claim 3 wherein at least one micromirror is tiltable.

8. The optical device of claim 3 wherein a first reflection micromirror is tiltable.

9. The optical device of claim 3 wherein at least 25% of the micromirrors are tiltable.

10. The optical device of claim 1 wherein:

a) the movable mirror comprises a micromirror array,

b) each micromirror in the array is separately movable,

c) at least one micromirror comprises a controllable diffraction grating.

11. The optical device of claim 10 wherein the reflector comprises a region of high reflectivity, and a region of low reflectivity.

12. The optical device of claim 11 wherein the reflector is disposed so that light diffracted by the controllable diffraction grating passes through the region of low reflectivity.

13. The optical device of claim 1 wherein the device has a free spectral range in the range of 0.2-150 nm.

14. The optical device of claim 1 wherein the device has a free spectral range that is an integer multiple of a bandwidth of the light beam.

15. The optical device of claim 1 wherein the light beam reflects from the mirror at least twice, and each reflection occurs in a different position on the mirror.

16. The optical device of claim 1 wherein the mirror and reflector are spaced apart a distance in the range of 10-1500 microns.

17. The optical device of claim 1 wherein the reflector has a uniform reflectivity.

18. The optical device of claim 1 wherein the reflector has a nonuniform reflectivity.

19. The optical device of claim 18 wherein the reflector has a linearly graded reflectivity.

20. The optical device of claim 1 further comprising a spatial light modulator disposed so that the reflector is between the spatial light modulator and the movable mirror.

21. The optical device of claim 1 wherein the movable mirror has a convex area for focusing the light beam.

22. The optical device of claim 1 wherein the reflector comprises a light valve having a variable reflectivity.

23. The optical device of claim 1 wherein the reflector and the movable mirror are planar parallel.

24. The optical device of claim 1 wherein the reflector and the movable mirror are not parallel.

25. An optical device comprising:

a) a partially reflecting, partially transmitting reflector;

b) a movable mirror spaced apart from the reflector, wherein the movable mirror can move to vary a spacing T between the reflector and movable mirror;

c) a light collimator for projecting a light beam between the movable mirror and the reflector at an oblique angle so that the light beam travels by reflecting between the reflector and movable mirror, and wherein a plurality of spaced apart emergent beams are produced by transmission of the light beam through the reflector;

d) a lens for receiving and focusing the emergent beams at a focal plane.

26. The optical device of claim 25 wherein adjacent emergent beams overlap less than 10% at the reflector.

27. The optical device of claim 25 further comprising an optical fiber disposed at the focal plane for receiving light from the lens.

28. The optical device of claim 25 further comprising a mirror at the focal plane so that the optical device provides dispersion.

29. The optical device of claim 25 wherein the oblique angle is in the range of 1-15 degrees from vertical.

30. The optical device of claim 25 wherein the movable mirror comprises a micromirror array, and wherein each micromirror is separately movable vertically.

31. The optical device of claim 30 wherein the number of micromirrors is in the range of 2-1000.

32. The optical device of claim 30 wherein the micromirrors are disposed so that the light beam reflects at most once from each micromirror.

33. The optical device of claim 30 wherein at least one micromirror is tiltable.

34. The optical device of claim 30 wherein a first reflection micromirror is tiltable.

35. The optical device of claim 30 wherein at least 25% of the micromirrors are tiltable.

36. The optical device of claim 25 wherein:

a) the movable mirror comprises a micromirror array,

b) each micromirror in the array is separately movable,

c) at least one micromirror comprises a controllable diffraction grating.

37. The optical device of claim 36 wherein the reflector comprises a region of high reflectivity, and a region of low reflectivity.

38. The optical device of claim 37 wherein the reflector is disposed so that light diffracted by the controllable diffraction grating passes through the region of low reflectivity.

39. The optical device of claim 25 wherein the device has a free spectral range in the range of 0.2-150 nm.

40. The optical device of claim 25 wherein the device has a free spectral range that is an integer multiple of a bandwidth of the light beam.

41. The optical device of claim 25 wherein the light beam reflects from the mirror at least twice, and each reflection occurs in different positions on the mirror.

42. The optical device of claim 25 wherein the mirror and reflector are spaced apart a nominal distance in the range of 10-2500 microns.

43. The optical device of claim 25 wherein the reflector has a uniform reflectivity.

44. The optical device of claim 25 wherein the reflector has a nonuniform reflectivity.

45. The optical device of claim 44 wherein the reflector has a linearly graded reflectivity.

46. The optical device of claim 44 wherein the reflector has reflectivity graded so that the emergent beams have approximately equal energy.

47. The optical device of claim 44 wherein the reflector has reflectivity graded so that the emergent beams have approximately a sinc function energy distribution.

48. The optical device of claim 25 further comprising a plurality of optical fibers at the focal plane, each fiber having a different length, and each fiber receiving a different wavelength from the lens, so that the device provides an optical code division multiple access encoding function.

49. The optical device of claim 25 further comprising a light valve for adjusting energy in at least one emergent beam.

50. The optical device of claim 25 further comprising a spatial light modulator disposed between the reflector and the lens.

51. The optical device of claim 25 wherein the movable mirror has a convex area for focusing the light beam.

52. The optical device of claim 25 wherein the reflector comprises a light valve having a variable reflectivity.

53. The optical device of claim 25 wherein the reflector and the movable mirror are planar parallel.

54. The optical device of claim 25 wherein the reflector and the movable mirror are not parallel.

55. An optical device comprising:

a) a partially reflecting, partially transmitting reflector;

b) an array of separately movable micromirrors spaced apart from the reflector, wherein each micromirror can move to vary a spacing T between the reflector and movable micromirror;

c) a light collimator for projecting a light beam between the movable mirror and the reflector at an oblique angle so that the light beam travels by reflecting between the reflector and movable micromirrors, and wherein a plurality of spaced apart emergent beams are produced by transmission of the light beam through the reflector;

d) a lens for receiving and focusing the emergent beams.

56. The optical device of claim 55 wherein the micromirrors and light beam collimator are disposed so that the light beam reflects at most once from each micromirror.

57. The optical device of claim 55 wherein adjacent emergent beams overlap less than 10% at the reflector.

58. The optical device of claim 55 further comprising a mirror at the focal plane so that the optical device provides dispersion.

59. The optical device of claim 55 wherein at least one micromirror comprises a controllable diffraction grating.

60. The optical device of claim 59 wherein the reflector comprises a region of high reflectivity, and a region of low reflectivity.

61. The optical device of claim 60 wherein the reflector is disposed so that light diffracted by

the controllable diffraction grating passes through the region of low reflectivity.

62. The optical device of claim 55 wherein the device has a free spectral range in the range of 0.2-150 nm.

63. The optical device of claim 55 wherein the reflector has a uniform reflectivity.

64. The optical device of claim 55 wherein the reflector has a nonuniform reflectivity.

65. The optical device of claim 64 wherein the reflector has a linearly graded reflectivity.

66. The optical device of claim 64 wherein the reflector has reflectivity graded so that the emergent beams have approximately equal energy.

67. The optical device of claim 64 wherein the reflector has reflectivity graded so that the emergent beams have approximately a sinc function energy distribution.

68. The optical device of claim 55 further comprising a photodetector array disposed at the focal plane.

69. The optical device of claim 55 further comprising a light valve for adjusting energy in at least one emergent beam.

70. The optical device of claim 55 further comprising a spatial light modulator disposed between the reflector and the lens.

71. The optical device of claim 55 wherein at least one micromirror has a convex shape.

72. The optical device of claim 55 wherein the reflector comprises a spatial light valve having a variable reflectivity.

73. The optical device of claim 55 wherein a first reflection micromirror is tiltable.

74. The optical device of claim 55 wherein at least 25% of the micromirrors are tiltable.

75. The optical device of claim 55 wherein at least one micromirror is tiltable.

76. The optical device of claim 75 wherein each tiltable micromirror is independently tiltable.

77. The optical device of claim 55 wherein the reflector and the movable mirror are planar parallel.

78. The optical device of claim 55 wherein the reflector and the movable mirror are not planar parallel.